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# **INSTRUCTION MANUAL**

FOR THE

# **VIBRATION DETECTOR TEST SET**

**1 SEPTEMBER 1956**

## VIBRATION DETECTOR TEST SET

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## VIBRATION DETECTOR TEST SET

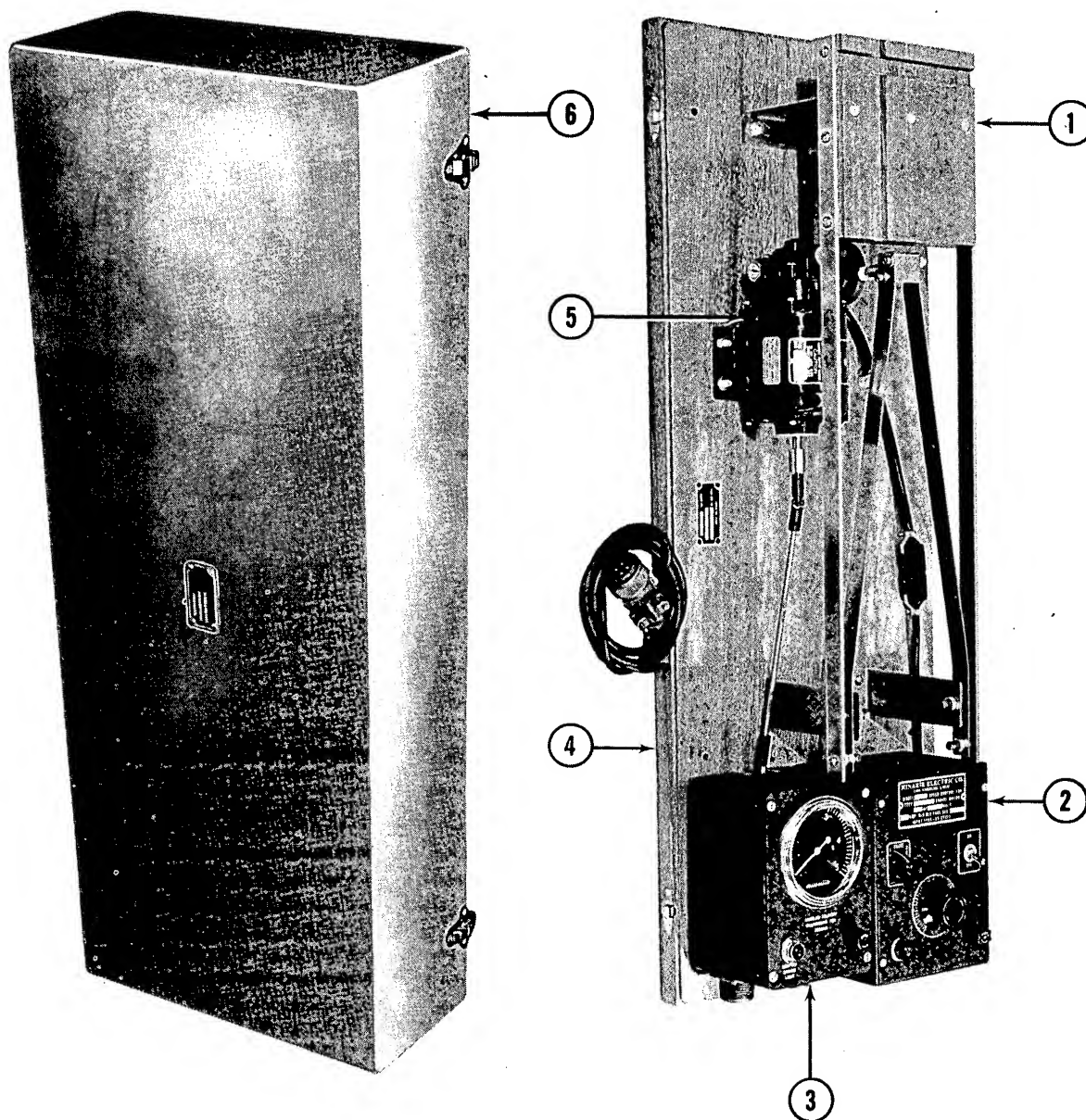


Figure 1-1. Vibration Detector Test Set

## VIBRATION DETECTOR TEST SET

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### Section I

#### DESCRIPTION

##### 1-1. GENERAL

The Vibration Detector Test Set, shown in figure 1-1, is an electro-mechanical device used to check the tripping threshold sensitivity of a Vibration Detector. The test set produces controlled angular velocities within a horizontal plane. The position in which the Vibration Detector is placed upon the test set determines whether roll, pitch, or yaw sensitivity will be checked. When the angular velocity produced by the test set exceeds the Vibration Detector's tripping threshold, an indicator light will start to flash. When the light flashes rhythmically, sensitivity can be determined by observing the milliradians per second of angular velocity indicated by the tachometer on the test set.

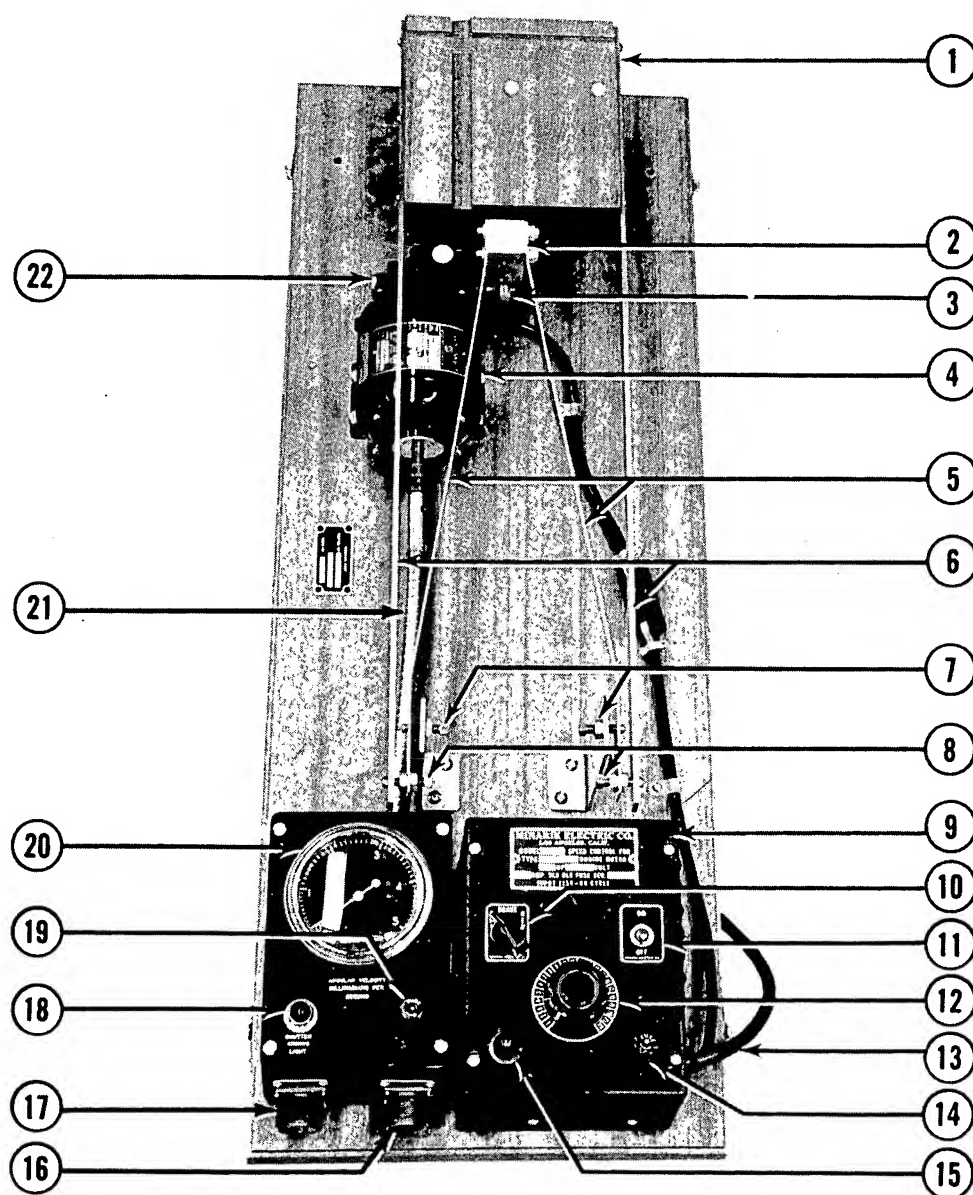
##### 1-2. MAJOR COMPONENTS

The Vibration Detector Test Set consists of the following major components: a Motor Speed Control Box; a Junction Box; a Drive Motor and Gear Box; a Vibration Detector Mounting Platform; a Test Set Mounting Base and Cover; and the necessary mechanical linkage and electrical cabling to complete the test set.

a. Motor Speed Control Box. (See figure 1-2.) The motor speed control box consists of a power ON-OFF switch, a BRAKE switch, and a red power indicator light. The motor speed control box is used to control the rpm of the drive motor, and to provide drive motor braking.

b. Junction Box. (See figure 1-2.) The junction box is used to supply power to the vibration detector being tested, and to indicate drive motor rpm in milliradians per second of angular velocity. A SHUTTER ARMING light indicates when the vibration detector's tripping threshold sensitivity has been exceeded.

## VIBRATION DETECTOR TEST SET



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|--|---|
| 1. VIBRATION DETECTOR<br>MOUNTING PLATFORM | 11. ON-OFF SWITCH                       |
| 2. CAM FOLLOWER MOUNTING<br>BLOCK          | 12. MANUAL SPEED SELECTOR               |
| 3. CAM                                     | 13. POWER CONNECTOR CABLE<br>(110 VOLT) |
| 4. DRIVE MOTOR                             | 14. FUSE HOLDER                         |
| 5. TRANSVERSE LEVER ARMS                   | 15. RED INDICATOR LIGHT                 |
| 6. MOUNTING PLATFORM<br>LEVER ARMS         | 16. CONNECTOR (28 VDC)                  |
| 7. FULCRUM MOUNTS                          | 17. MINI-VIB CONNECTOR                  |
| 8. PIVOT CONNECTORS                        | 18. GREEN INDICATOR LIGHT               |
| 9. MOTOR SPEED CONTROLLER<br>BOX           | 19. FUSE HOLDER                         |
| 10. BRAKE SWITCH                           | 20. TACHOMETER                          |
|  | 21. MECHANICAL LINKAGE                  |
|  | 22. GEAR BOX                            |

Figure 1-2. Test Set Components

## VIBRATION DETECTOR TEST SET

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c. Drive Motor and Gear Box. (See figure 1-1.) The drive motor is a shunt-wound type. The gear box is mounted on one end of the motor and is used to reduce the output speed of the motor to the vibration detector mounting platform actuating cam. The actuating cam is mounted on the output shaft of the gear box, and is used to transmit the angular velocity to the mounting platform.

d. Vibration Detector Mounting Platform. (See figure 1-1.) The mounting platform is fabricated from a single piece of mahogany in which two intersecting grooves have been cut. A flexible steel plate is used for support. Two mounting platform lever arms, two transverse lever arms, two pivot connectors, two fulcrum pivot mountings, a cam follower mounting block, and a cam follower are incorporated to provide the necessary linkage to actuate the mounting platform.

e. Test Set Base and Cover. (See figure 1-1.) The test set base is a single piece of mahogany, which is used as a mount for all test set components. The cover is used to enclose the test set and is secured in position on the base by four latches.

### 1-3. LEADING PARTICULARS

a. Overall Dimensions.

Height	. . . . .	6-1/4 inches
Length	. . . . .	30-1/2 inches
Width	. . . . .	11-1/2 inches

b. Total Weight . . . . . 10 pounds

c. Available Angular Velocity Speed.

. . . . . 0.0 to 5.0 milliradians  
per second

d. Power Requirements.

Drive Motor	. . . . .	110 volts, 60 cycle, ac
Vibration Detector	. . . . .	28 volts dc



## **VIBRATION DETECTOR TEST SET**

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## VIBRATION DETECTOR TEST SET

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### Section II

#### THEORY OF OPERATION

##### 2-1. GENERAL

The operational information contained in this section is included in order to help the operator trace and correct any malfunctions which may be encountered during the operation of the Vibration Detector Test Set.

##### 2-2. THEORY OF OPERATION

Operation of the Vibration Detector Test Set is started when the power ON-OFF switch on the motor speed controller box is placed in the ON position. As the speed selector is advanced, controlled power is applied to the drive motor. Rotation of the drive motor drives the tachometer through mechanical linkage. The tachometer is calibrated to indicate drive motor rpm as angular velocity in milliradians per second. The opposite end of the drive motor furnishes drive power to a gear train in the speed reduction gear box. The gear train, in turn, rotates a cam attached to a drive shaft extending outward from the gear box. Rotation of the cam causes a cam follower, mounted in a mounting block, to raise and lower the transverse lever arms. The cam follower action is transferred from the fulcrum-mounted transverse lever arms, to the mounting platform lever arms, through pivot connections which are used to fasten the ends of the transverse lever arms to the ends of the mounting platform lever arms. The mounting platform is secured to a flexible steel plate to which the mounting platform lever arms are connected. As the cam follower is raised, the mounting platform lever arms cause the platform to tip downward. As the cam follower is lowered, the mounting platform is returned to the "rest" position. The frequency with which the cycle is repeated governs the angular velocity produced by the test set.

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## VIBRATION DETECTOR TEST SET

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### Section III

#### PREPARATION FOR OPERATION

##### 3-1. GENERAL

When preparing the Vibration Detector Test Set for operation, it must be visually checked for the following: security of mounting platform lever arm pivots; security of transverse lever arm fulcrum pivots; and proper adjustment and security of the cam follower adjustment screw. The test set must be provided with an exceptionally stable rest in order to obtain correct data from the units being tested. Prior to testing, each vibration detector requires a 15-second warm-up period, and a 15-second stabilizing period after each position change.

#### CAUTION

The vibration detector must be handled with care as any sharp blow may result in serious damage to the unit.

##### 3-2. TEST SET-UP

- a. Place the vibration detector to be tested on the mounting platform in the desired test position, see figure 4-1.
- b. Connect the special jumper cable from the vibration detector to the MINI-VIB receptacle on the junction box.
- c. Connect the cable from the motor speed control box to a 110-volt, 60 cycle, ac power source.
- d. Connect a cable to a 28-volt dc power source and to the junction box POWER receptacle.

## VIBRATION DETECTOR TEST SET

- e. Place the BRAKE switch on the motor speed control box in the FWD position.
- f. Place the speed selector control on the motor speed control box at 0.
- g. Place the power ON-OFF switch on the motor speed control box in the ON position.

## VIBRATION DETECTOR TEST SET

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### Section IV

#### OPERATION

##### 4-1. GENERAL

The following paragraphs provide step by step instructions for testing the sensitivity of each of the vibration detector's rate gyros.

##### 4-2. ROLL GYRO SENSITIVITY TEST (See figure 4-1.)

- a. With the test set prepared per instructions in paragraph 3-2, place the vibration detector to be tested lengthwise across the mounting platform, with the top up.
- b. Advance the speed selector control slowly until the tachometer indicates 3 milliradians per second of angular velocity.

#### NOTE

The shutter ARMING light should glow steadily up to 3 milliradians per second as indicated on the tachometer, indicating that the gyro threshold sensitivity has not been exceeded.

- c. Place the power ON-OFF switch in the OFF position.

##### 4-3. PITCH GYRO SENSITIVITY TEST (See figure 4-1.)

- a. With the test set prepared per instructions in paragraph 3-2,

## VIBRATION DETECTOR TEST SET

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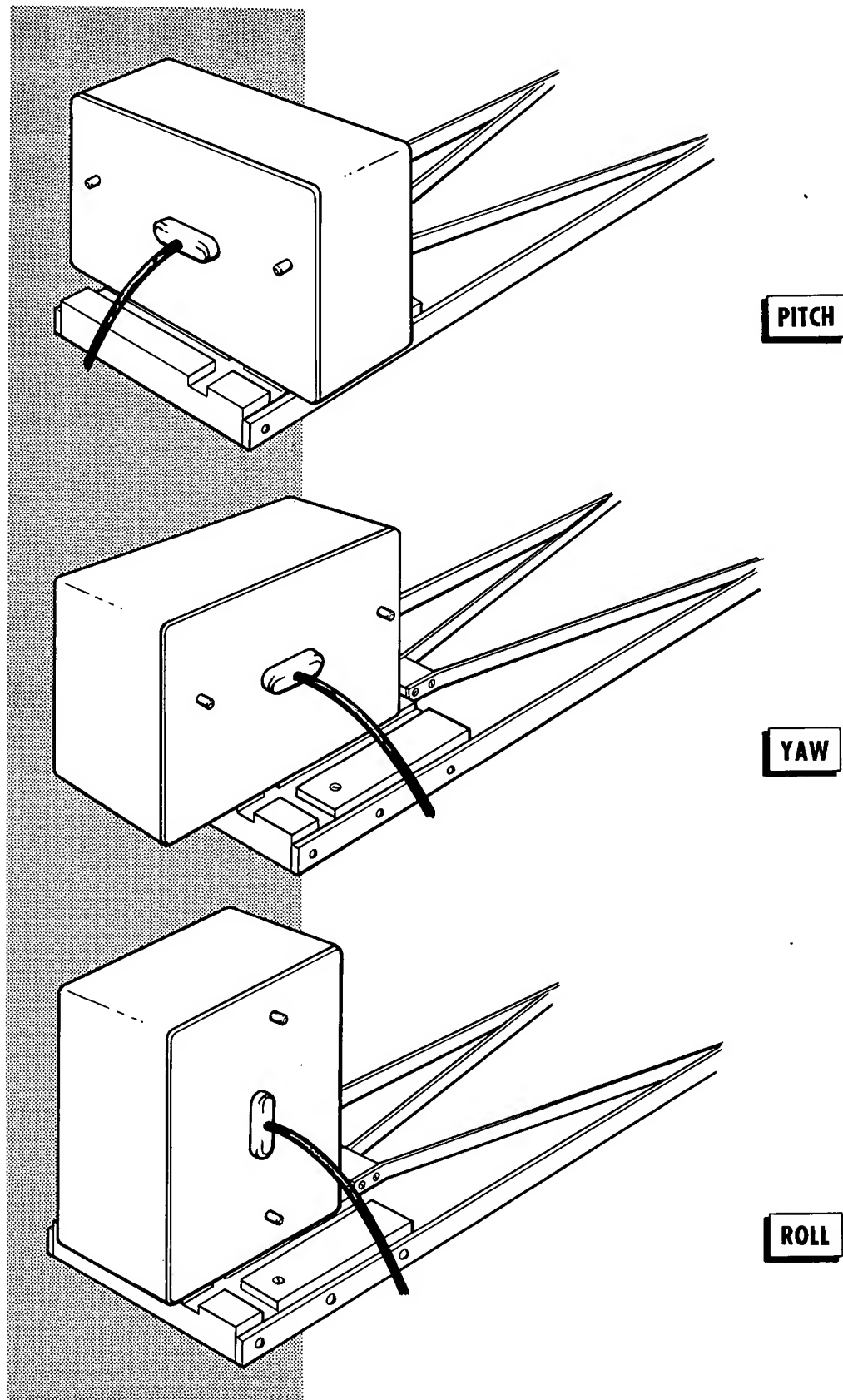


Figure 4-1. Vibration Detector Test Attitudes

## VIBRATION DETECTOR TEST SET

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place the vibration detector to be tested parallel to the sides of the mounting platform, with the top up.

b. Perform steps b and c of paragraph 4-2.

### 4-4. YAW GYRO SENSITIVITY TEST (See figure 4-1.)

a. With the test set prepared per instructions in paragraph 3-2, place the vibration detector to be tested on end, with the face toward the mounting platform lever arm.

b. Perform steps b and c of paragraph 4-2.



## **VIBRATION DETECTOR TEST SET**

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## VIBRATION DETECTOR TEST SET

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### Section V

### MAINTENANCE

#### 5-1. GENERAL

Maintenance of the Vibration Detector Test Set consists only of periodic visual inspection and the replacement of burned out fuses or lights. Visually check for excessive looseness at pivot points and for tightness of mounting bolts. No attempt should be made to repair the test set in the field. If any malfunction occurs, the test set is to be returned to the factory for repair.

#### 5-2. SPECIAL TOOLS

No special tools are required to maintain the Vibration Detector Test Set.

#### 5-3. LUBRICATION

The Vibration Detector Test Set is lubricated upon assembly at the factory and requires no further lubrication.

**VIBRATION DETECTOR TEST SET**

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## VIBRATION DETECTOR TEST SET

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### Section VI

### OVERHAUL

#### 6-1. GENERAL

Overhaul of the Vibration Detector Test Set consists of replacing the lever arm pivots, the cam follower, and the flexible steel mount of the mounting platform. No attempt should be made to alter or rework the motor speed controller, the tachometer, or the electric motor. Overhaul of the Vibration Detector Test Set must be performed at the factory.

**VIBRATION DETECTOR TEST SET**

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# VIBRATION DETECTOR TEST SET

## Section VII

### PARTS LIST

PART NO.	PART NAME	UNITS PER TEST SET
32-VDTS-735260	VIBRATION DETECTOR TEST	
	SET ASSY. . . . .	1
32-VDTS-735260-1	STRIP, 1/16x3/4 L.H. (Type	
	321 S/S . . . . .	1
32-VDTS-735260-2	STRIP, 1/16x3/4 R.H. (Type	
	321 S/S) . . . . .	1
32-VDTS-735260-3	HINGE, 1/16 Thick (Type 321	
	S/S) . . . . .	1
32-VDTS-735260-4	BRACKET, 1/8x1-1/2 (Type	
	321 S/S) . . . . .	2
32-VDTS-735260-5	CAM (Steel AISI C 1020) . . .	1
32-VDTS-735269	BLOCK, Follower (Al. Alloy	
	2024-T4) . . . . .	1
32-VDTS-735260-7	BASE, 1x11-1/2x30-1/2 Wood	
	Mahogany . . . . .	1
32-VDTS-735260-8	TABLE, 1x5-3/4x6 Wood	
	Mahogany . . . . .	1
32-VDTS-735260-9	STRIP, 1/8x3/4x22-3/8 (Type	
	321 S/S) . . . . .	2
32-VDTS-735261	JUNCTION BOX . . . . .	1
32-VDTS-735263	PANEL . . . . .	1
32-VDTS-730163-51069	RECEPTACLE, Cannon	
	Elect., AN 3102A-16-11P . . .	1
32-VDTS-730163-51083	RECEPTACLE, Cannon	
	Elect., AN 3102A-18-10S . . .	1
32-VDTS-730163-51084	PLUG, Cannon Elect.,	
	AN 3106E-18-10P. . . . .	1
32-VDTS-730163-51060	PLUG, Cannon Elect.,	
	Type DA . . . . .	1
32-VDTS-730163-51061	JUNCTION SHELL, Can-	
	non Elect., Type DA . . . . .	1

## VIBRATION DETECTOR TEST SET

PART NO.	PART NAME	UNITS PER TEST SET
32-VDTS-735265	NAMEPLATE, Power . . . . .	1
32-VDTS-735266	NAMEPLATE, Vibration Detector . . . . .	1
32-VDTS-730175-51914	SCREW, Fl. Hd., 100 csk. #8-32NC2x1/2.S/S . . . . .	4
32-VDTS-730175-51117	SCREW, Fil.Hd., #4-40 NC2x5/16 . . . . .	8
32-VDTS-730180-51010	NUT, Elastic, Stop (ESNA #79M-40 S/S) . . . . .	8
32-VDTS-730160-51035	WIRE, 20 Ga., Black, 16 Strand . . . . .	2'
32-VDTS-730160-51036	WIRE, 20Ga., White, 16 Strand . . . . .	2'
32-VDTS-730186-51003	RIVET, Rd.Hd., (AN 430- A3-3) . . . . .	4
32-VDTS-735261-1	SPACER, 5/32x3-1/2 Dia. (Al. Alloy 6061-T6) . . . . .	1
32-VDTS-735252-51003	TACHOMETER (Stewart Warner Mod. 770-D) . . . . .	1
32-VDTS-735252-51012	FUSE HOLDER (Buss Type HKP) . . . . .	1
32-VDTS-735252-51013	FUSE (Buss Type AGC- 1-1/2A). . . . .	1
32-VDTS-735252-51014	PILOT LIGHT (Green) Dialight Corp. #81410- 112). . . . .	1
32-VDTS-735252-51006	BOX (Moorlee #MT 13781- 064-400) . . . . .	1
32-VDTS-735262	COVER . . . . .	1
32-VDTS-735262-1	BOX, Al.Sht. (.061) 6061- T4 QQ-A-327 Cond. W . . . . .	1
32-VDTS-735252-51005	CATCH, Suitcase, Corbin #1803 1/2(Upper) . . . . .	4
32-VDTS-730186-51001	RIVET, Fl.Hd., 1/8x5/16 AN436-AD4-5 . . . . .	8
32-VDTS-730186-51111	RIVET, Rd.Hd., 3/32x1/4 AN430-AD3-4 . . . . .	4
32-VDTS-739829	NAMEPLATE . . . . .	1
32-VDTS-739829	NAMEPLATE . . . . .	1

## VIBRATION DETECTOR TEST SET

PART NO.	PART NAME	UNITS PER TEST SET
32-VDTS-735252-51001	CONTROLLER, Motor Speed Minarik Elect. Co. #SH10 . . .	1
32-VDTS-735252-51002	MOTOR, 1/50 H.P.D.C. Shunt Bodine #NSH12R18 . . .	1
32-VDTS-735252-51005	CATCH, Suitcase, Corbin #1883 1/2 (Bottom) . . .	4
32-VDTS-730175-51911	SCREW, Rd.Hd., Wood #10x 1" S/S . . . . .	14
32-VDTS-730175-51001	SCREW, Hex Soc. Set, #6-32x 5/16 Cup Pt. S/S . . . . .	1
32-VDTS-730175-51910	SCREW, Hex Cap Nylon 1/4- 20x1" . . . . .	1
32-VDTS-730175-51023	SCREW, Set, Sq. Hd., 1/4- 20NC 2x1" Sil. Br'nz. . . . .	4
32-VDTS-730180-51082	NUT, Hex 1/4-20NC-2 St. Cad. Pl. . . . .	11
32-VDTS-730184-51557	WASHER, Spring Lock, 1/4 I.D. St. Cad. Pl. . . . .	4
32-VDTS-730184-51022	WASHER, Plain, 1/4 I.D. Heavy Series . . . . .	4
32-VDTS-730175-51139	SCREW, Fil.Hd., 1/4-20NC2x 1-3/8 . . . . .	4
32-VDTS-730175-51155	SCREW, Fil.Hd., 10-32NF2x 1-1/2 . . . . .	2
32-VDTS-730175-51913	SCREW, Rd.Hd., Wood #6x 3/4 Cad. Pl. . . . .	10
32-VDTS-730180-51019	NUT, Self-locking, #10-32 Hex S/S . . . . .	8
32-VDTS-730184-51030	WASHER, #10 AN960-10 Cad. Pl. . . . .	8
32-VDTS-730175-51451	SCREW, Fl.Hd., 82°, c'sk, #10-32x1-3/8 . . . . .	6
32-VDTS-730151-51004	CLAMP, Burndy Eng. Co. HP4N . . . . .	2
32-VDTS-735453-51023	PLUG, Hubbell #7568 . . . . .	1
32-VDTS-730180-51050	NUT, Anchor, Floating EXNA #22A21-02 . . . . .	2
32-VDTS-730186-51049	RIVET, 3/32x1/4 AN 426AD3- 4 . . . . .	4



## VIBRATION DETECTOR TEST SET

PART NO.	PART NAME	UNITS PER TEST SET
32-VDTS-730175-51916	SCREW, Rd.Hd., Wood	
	#3x1/2 Cad. Pl. . . . .	4
32-VDTS-735252-51008	FUSE, 4/10A, Little Fuse	
	(#3AG) . . . . .	3
32-VDTS-735270	LINKAGE ASSY . . . . .	1
32-VDTS-735270-1	COUPLING (Type 321 S/S) .	1
32-VDTS-735270-2	SHAFT (Type 321 S/S) . .	1
32-VDTS-735270-3	DRIVE END (Type 321 S/S) .	1
32-VDTS-735252-51016	NUT FITTING, #97344	
	F. W. Birnie Company .	1
32-VDTS-735252-51017	UNIV. JOINT (Boston	
	#J37B) Andrews Hdwr. .	2
32-VDTS-735252-51018	BUSHING, Teflon (3/8 IDx	
	5/8 ODx3/4 LG.) . . . .	1
32-VDTS-735252-51019	SCREW (Set) #4-40 (Half	
	Dog Point) . . . . .	3